

Evaluation of Primary Dendrite Arm Spacings from Aluminum-7wt% Silicon alloys
Directionally Solidified aboard the International Space Station – Comparison with Theory

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Aluminum – 7wt% silicon alloys were directionally solidified in the microgravity environment aboard the International Space Station as part of the “Microstructure Formation in CASTing of Technical Alloys under Diffusive and Magnetically Controlled Convective Conditions” (MICAST) European led program. Cross-sections of the sample during periods of steady-state growth were metallographically prepared from which the primary dendrite arm spacing (λ_1) was measured. These spacings were found to be in reasonable agreement with the Hunt-Lu model which assumes a diffusion-controlled, convectionless, environment during controlled solidification. Deviation from the model was found and is attributed to gravity-independent thermocapillary convection where, over short distances, the liquid appears to have separated from the crucible wall.